

Index

- Acceleration, 120, 126, 133, 144. *See also*
Horsepower; Power of vehicle
- Age distribution of population, 131, 132
- Age of household members, 120, 121, 123,
143, 164
- Age of vehicle, 120, 121, 157, 163
- Aggregation of choice probabilities, 98–102
- Alternative-specific constants
adjustment for choice based samples, 49
adjustment for forecasting, 104, 197–202
defined, 24–25
normalization, 26–27
to equate sample shares with average
probabilities, 46–47
use for correcting violations of
independence from irrelevant
alternatives, 21–24
- Alternatives
characteristics of, 8
defined, 4
- Average choice probabilities
calculation of, 41, 100
inconsistency of using averages of
explanatory variables, 42
use of alternative-specific constants for
equality with sample shares, 46–47
- Binary logit. *See also* Logit choice
probabilities
example, 17
expression, 26
- Braking distance, 144
- Characteristics of alternatives
observed, 8, 10
unobserved, 10
- Characteristics of decisionmaker
how enter representative utility, 27–30
observed, 8, 10
relation to taste variation
in logit, 29–31
in probit, 57–59
unobserved, 10
- Choice based sample
adjustment of alternative-specific
constant, 49
defined, 48
estimation of logit models on, 48–49
- Choice probabilities
definition/meaning, 11
derivation from utility theory
in general, 11–14
logit, 53–54
probit, 55–57
- expression for
in general, 8
logit, 15
probit, 56
simple GEV (nested logit), 68–69
- Choice set
defined, 7
partition of, in GEV models, 65–67
properties, 4–5
- Clark method of estimating probit, 62–63,
64
- Compensatory model, defined, 115
- Conditional indirect utility function, 83,
137, 140–141
- Conditional logit. *See* Logit choice
probabilities
- Conditional probability, in GEV models,
68–69
- Consistent demand equations, 129–130,
132–133
- Corporate Average Fuel Efficiency
standards, 190
- Cost of owning an auto, 115, 116, 132. *See*
also Price of vehicle
- Crash worthiness, 239
- Credit, 130, 131
- Depreciation rates, 194
- Derivatives
average, 42–43
of logit probabilities, 37–40
- Destination choice, 36–37
- Diesel price. *See* Fuel price
- Diesel vehicles, 173, 179, 183, 185–186, 188
- Direct utility function, 79–80, 82
- Discrete choice situation, defined, 5–7
- Education of household, 123, 131, 143,
164
- Elasticities
average, 42–43
of logit probabilities, 40
- Electric vehicles, 111, 124, 125–126, 173,
179, 183, 185, 188, 189, 190, 226–227,
232–233
- Employment status. *See* Workers in
household
- Endogeneity bias
in continuous/discrete models, 88
correction for, 88–91
- Estimation. *See also* Goodness of fit;
Hypothesis testing; Log likelihood
function
continuous/discrete models, 86–97

- Estimation (cont.)
- logit
 - on choice based sample, 48–49
 - on exogenous sample, 44–47
 - on subset of alternatives, 20–21, 47–48, 151
 - probit
 - Clark approximation, 62–63, 64
 - maximum likelihood, 61
 - Monte Carlo method, 63–64
 - simple GEV (nested logit), 73–76
 - Exhaustive set of alternatives, defined, 4
 - Exogenous sample
 - defined, 44
 - estimation on
 - continuous/discrete models, 86–97
 - logit, 44–47
 - probit, 61–64
 - simple GEV (nested logit), 73–76
 - Extreme value distribution. *See also* Generalized extreme value distribution
 - derivation of logit probabilities, 17, 53–54
 - formula, 53
 - Finite set of alternatives, defined, 4
 - Forecasting, 102–104, 123
 - Foreign vehicles, 116, 157, 181
 - Fuel efficiency/economy, 120, 131, 132, 133, 136, 144, 173, 178–179, 180, 190, 203–217. *See also* Operating cost
 - Fuel price, 131, 136, 164, 168, 170, 173, 177, 179, 183, 185–186, 194, 224–225, 226–227
 - Fuel price elasticities, 185, 186
 - Gas price. *See* Fuel price
 - Generalized extreme value (GEV) distribution
 - three-level nested case, 138
 - two-level nested case, 67
 - GEV choice probabilities
 - more complex cases, 72–73, 139–140
 - simple cases
 - decomposition into marginal and conditional probabilities, 68–69
 - formula, 68
 - Goodness of fit, statistics, 49–51
 - Goods/leisure tradeoff, 31–36
 - Hedonic demand model, 239
 - Horsepower, 120, 126, 132, 156, 173, 181, 203–217. *See also* Power of vehicle
 - Household size, number of people in household, 120, 121, 134, 136, 146, 148, 155, 164, 170, 173, 175–177
 - Hypothesis testing, 51–53
 - Hypothetical choice situations, 124–126, 127, 128
 - Inclusive price, 236
 - Inclusive utility. *See* Inclusive value
 - Inclusive value
 - approximation to, 143
 - defined, 69
 - Income elasticity, 184
 - Income of household, 115, 116, 120, 121, 123, 130, 131, 132, 134, 136, 137, 138, 140, 143, 146, 148, 151, 153, 160, 164, 173, 175, 177, 183, 184, 222–223
 - Independence from irrelevant alternatives
 - red bus/blue bus example, 19–20, 22–23
 - regarding GEV (nested logit), 65–67, 69–70
 - regarding logit, 18–24, 55, 122
 - regarding probit, 55, 59–61
 - use of alternative-specific constants to mitigate violations, 21–24
 - Indirect utility function, 79–80, 82
 - Instrumental variables estimation of continuous/discrete models, 90–91
 - Interest rates, 130. *See also* Credit
 - Interior space/dimension of vehicle. *See* Size of vehicle
 - Iterative proportional fitting, 237
 - Lexicographic preferences, 239
 - Licensed drivers, 132
 - Likelihood function, 45. *See also* Log likelihood function
 - Likelihood ratio index, 49–51
 - Likelihood ratio test, 51–53
 - Liquid propane gas price. *See* Fuel price
 - Liquid propane gas (LPG) vehicles, 173, 179, 183, 185, 188, 190, 226–227
 - Log likelihood function. *See also* Likelihood function; Quasi log likelihood function
 - defined, 45
 - use in estimation of
 - logit, 45–46
 - probit, 61
 - simple GEV (nested logit), 74, 75–76
 - Logit choice probabilities
 - average, 41–42
 - binary case, formula, 26
 - derivation, 53–54
 - derivatives, 37–40, 42–43
 - elasticities, 40, 42–43

- formula, 15
- properties, 16–17, 18–19
- Luggage space, 132, 144, 155–156, 162, 173, 203–217
- Luxury of vehicle, 133, 156. *See also* Prestigious vehicles
- Marginal probability, in GEV models, 68–69
- Maximum likelihood estimation
 - of continuous/discrete models, 86
 - defined, 44–45
 - of logit, 45–46
 - of probit, 61
 - of simple GEV (nested logit) models, 74, 75–76
- Methanol price. *See* Fuel price
- Methanol vehicles, 173, 178, 179, 183, 185, 188, 190, 226–227
- Miles per gallon. *See* Fuel efficiency/economy
- Money holding, 130
- Monte Carlo method
 - for aggregate simulation, 100–101
 - for estimating probit, 63–64
- Mother logit, 21–22
- MPG. *See* Fuel efficiency/economy
- Multinomial logit, example, 17–18. *See also* Logit choice probabilities
- Mutually exclusive alternatives, defined, 4
- National Transportation Survey, 143–144
- Nested logit, 72. *See also* GEV choice probabilities
- Noise of vehicle, 133, 144
- Noncompensatory models, 126–129
- Normal distribution
 - in derivation of probit, 55–57
 - formula, 55
- Normalization
 - of alternative-specific constant, 25, 26–27
 - of variance in probit, 59, 236
- Operating cost, 120, 121, 126, 131, 132, 133, 134, 137, 138, 140, 144, 151, 153–155, 160, 164, 178–179, 179–180, 181. *See also* Fuel efficiency/economy
- Ordered logit, 72
- Partition of choice set, in GEV models, 65–67
- Percent correctly predicted, 51
- Performance of vehicle. *See* Power of vehicle
- Pivot point analysis, 105–107
- Pooled sample
 - defined, 87
 - selectivity correction approach in continuous/discrete models, 95–96
 - two-stage estimation of continuous/discrete models, 87–91
- Population density, 130
- Power of vehicle, 120, 123, 126, 133. *See also* Acceleration; Horsepower
- Prestigious vehicles, 162–163. *See also* Luxury of vehicle
- Price of vehicle, 120, 121, 123, 126, 130, 131, 132, 133, 134, 144, 151, 153–155, 158, 160, 172, 173, 179–180, 181, 189, 194, 203–217
- Probit choice probabilities
 - derivation, 55–57
 - formula, 56
- Qualitative choice situation, defined, 4–7
- Quasi log likelihood function, 47–48
- Range of vehicle, 124, 126
- Red bus/blue bus
 - correction with alternative-specific constants, 22–23
 - standard example, 19–20
- Repairs, 133, 144
- Representative utility
 - defined, 15
 - differences in, 25–29
 - linear-in-parameters, defined, 24
 - nonlinear-in-parameters, 35–37
 - specification of, 24–37
 - use of utility theory, 31–35
- Roy's identity
 - proof, 80–82
 - purpose, 80, 82
 - use in specifying continuous/discrete models, 82–84, 137, 141
- Safety of vehicle, 128
- Sales tax, 238
- Sample enumeration, 99–101, 103–104, 173
- Seats in vehicle, seating capacity, 120, 126, 128, 132, 134, 181
- Segmentation, 101
- Selectivity bias
 - in continuous/discrete models, 91–93
 - correction for, 93–97
- Selectivity correction approach to continuous/discrete models, 91–97

- Sequential estimation of simple GEV models, 74–76
- Sequential logit, 72
- Shoulder room of vehicle, 144, 155, 156, 160–162, 173, 203–217
- Simultaneous estimation of GEV models, 76
- Size of household. *See* Household size
- Size of vehicle, 120, 121, 124, 126, 127, 128, 132, 133, 155, 163
- Specification of qualitative choice models in general, 7–14
 - logit, 15, 53–54
 - probit, 55–57
 - simple GEV (nested logit) models, 68–69
- Speed of vehicle, 126. *See also* Acceleration; Power of vehicle
- Stock prices, 130
- Strikes, 131
- Structured logit, 72
- Styling of vehicle, 133

- Taste variation
 - in logit, 29–31
 - in probit, 57–59
- Three-level GEV, 73, 138
- Threshold for characteristics, 126–127
- Transaction cost, 151, 155
- Transit availability/quality, 115, 116, 144, 148, 149, 164, 170, 195
- Tree diagram for GEV models, 66–67, 73–74
- Trucks, 134, 144, 150, 157–158, 173, 238
- Two-level GEV, 72
- Two-stage estimation
 - of continuous/discrete models, 87–91
 - of simple GEV (nested logit) models, 74–76
- Turning radius, 144

- Utility, unobserved component of. *See also* Representative utility; Utility theory
 - defined, 10
 - distribution
 - for logit, 17, 53
 - for probit, 55–56
 - for simple GEV (nested logit), 67, 138
- Utility theory. *See also* Representative utility; Utility, unobserved component of
 - as an aid to specifying representative utility, 31–35
 - benefits of, 8–9
 - in derivation of continuous/discrete models, 82–85
 - relation to choice models, 8–14
 - relevant background, 78–82
 - Roy's identity, 80–82
- Weibull distribution, 235. *See also* Extreme value distribution
- Weight of vehicle, 120, 123, 124, 128, 133, 144
- Wheelbase, 120
- Workers in household, 115, 116, 130, 131, 134, 136, 143, 146, 148, 164, 168, 173, 175–177, 183, 186–188, 228–229